WHAT IS A DAIRY SURPLUS?

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The Food Security Act of 1985 specifies that if annual purchases of dairy products by the U.S. Department of Agriculture's Commodity Credit Corporation (CCC) are anticipated to be greater than the equivalent of five billion pounds of milk (milkfat basis), the Secretary of Agriculture shall reduce the dairy price support by 50 cents per hundredweight on January 1 of each of the years 1988, 1989, and 1990.1

Current legislation more or less implies that any purchase over five billion pounds milk equivalent is too much. Not everyone agrees. By tying price changes to CCC purchases, the question "what is a dairy surplus" is raised. This paper examines the issues and controversies surrounding the definition of dairy surpluses.

Surpluses Defined

In the dairy industry the concept of surplus has many meanings. Sometimes "surplus milk" is referred to as anything in excess of a market's fluid milk or Class I needs. This fluid surplus concept is too narrow to apply to price support program issues. At other times statements are made that if a given state or region produces more total quantity than it consumes, then that area has a surplus. In other cases, the existence of sales to the CCC is used as an indication of surplus conditions in an area. These latter two concepts of surplus may not be consistent. The mix of milk products made and consumed in a state or region may not match. There is a difference between a general surplus of milk versus a surplus of products made from milk. For example, the Northeast is a substantial net importer of dairy products; yet it still does make small sales to the CCC.

In a market economy, the supply of and the demand for a particular product interact to generate a market clearing price. At that price all of the product brought to the market is consumed by the market. If, however, factors interfere with the unrestricted operation of a market, a market clearing solution may not result. In the dairy industry, if the dairy price support level is above the market clearing price and quantity solution, more milk will be supplied than can be removed by commercial customers. The amount of this extra supply is referred to by economists as surplus.

Surpluses arise from two interacting forces. When the price support is above the market clearing level, customers will buy less product than they would have at the lower equilibrium price. Simultaneously, at the higher prices producers will want to supply more. Surplus solutions therefore usually involve discussion of methods to increase consumption and reduce the excess product.

Table 1 highlights the supply-demand and surplus situation of the U.S. dairy industry over the last few years.

<table>
<thead>
<tr>
<th>Year</th>
<th>Total Milk Production</th>
<th>Commercial Disappearance</th>
<th>CCC Net Removals</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(billion lbs.)</td>
<td>(billion lbs.)</td>
<td>Amount (billion lbs.)</td>
</tr>
<tr>
<td>1985</td>
<td>143.1</td>
<td>130.6</td>
<td>13.2</td>
</tr>
<tr>
<td>1986</td>
<td>143.4</td>
<td>133.5</td>
<td>10.6</td>
</tr>
<tr>
<td>1987</td>
<td>142.6</td>
<td>135.6</td>
<td>6.7</td>
</tr>
<tr>
<td>1988</td>
<td>145.5</td>
<td>137.2</td>
<td>8.9</td>
</tr>
</tbody>
</table>

1 Milk equivalent, milkfat basis.

SOURCE: Dairy Situation and Outlook, USDA, Economic Research Service.

The supply, total milk production in the U.S., was 145.5 billion pounds in 1988. Commercial disappearance, the purchases of milk and dairy products by U.S. consumers, represents the open market demand for dairy products. It amounted to 137.2 billion pounds in 1988. After taking into account much smaller quantities of consumption on farms, imports, and changes in commercial stocks, any milk left over is sold to the CCC as a storable dairy product and is reported as CCC net removals. In the last four years CCC net removals have ranged from 4.7 to 9.2 percent of total U.S. production (milk equivalent, milkfat basis).

The numbers in Table 1 are used by most dairy industry observers to describe the balance between milk supply and demand. However, these numbers are not as straightforward as they seem. There are many factors complicating the reporting of milk production and commercial use of milk data. Some milk produced is used on farms and never sold. Some milk produced in one year is made into manufactured products that are not sold until the next year. Therefore, data must be adjusted for inventory changes. Imports are another source of dairy products available for commercial sale. Also, the industry may buy back some of the CCC's stock when it is short. For these and other reasons, the CCC net removals are not the result of the simple subtraction of commercial use from production.
The complications and controversies surrounding the nature of a dairy surplus arise from the basic nature of milk. First, milk is perishable. For milk to be saved it must be processed into storable forms. In addition, milk production and consumption are seasonal. More milk is produced in the spring of the year, while peak consumption occurs during the fall. This requires that excess production from one time period must be stored and sold in another time period. Finally, milk contains many specific component elements (milkfat, protein, etc.). Of the hundreds of products made from milk, most have different combinations of milk components. Therefore, the milk composition of the end products purchased by consumers may not match the total component supply purchased. All of these factors mean that straightforward supply-demand surpluses analyses oversimplify the surplus definition in the dairy industry. A few of the complications in defining dairy surpluses are discussed below.

**Needed Reserves?**

If the industry is so complex and tricky to balance, it is prudent for someone to carry reserve supplies to act as a stabilizing influence. Yet, if carrying reserve supplies subjects private firms to undue financial risks, they will not assume the task. In such cases, a few firms may carry the costs while all other firms benefit from the stabilizing effect. Under these conditions, the government programs may be designed to do what the marketplace would like to do but can’t manage to do in an efficient or equitable manner. How big does a market stabilizing reserve have to be? Are reserves of this kind also a surplus that should count in price support decisions?

There can be two kinds of temporal surpluses in the dairy industry; intra-year and inter-year surpluses. Surpluses occur within a year because milk production and consumption are nonsynchronous. Milk must be processed in surplus production times and stored for sale during peak demand periods. The seasonal balancing process requires that there be excess processing capacity within the dairy industry. These kinds of intrayear surpluses are a natural part of the dairy industry.

It is difficult to "fine tune" the large, complex U.S. dairy system. Variability in weather, feed conditions, and other factors can alter the supply and demand for dairy products significantly within short time periods. Supply variability in the face of a dairy demand which tends to respond sluggishly to price changes, means that a little bit of extra milk supply (or a shortage) can cause significant decreases (or increases) in milk prices. To prevent major market disruptions, some excess reserve capacity is needed for inter-year stability.

Because no one gains from significant market and price instability, a modest surplus reserve capacity is needed to make market operations orderly both within and across years. If the orderly operation of the U.S. milk markets depends on the government carrying surplus reserves, should those reserves be counted as dairy sector surpluses? If not, how large should these “reserve surpluses” be? Who should decide the appropriate level of "needed" reserves, and how should it be calculated?

The U.S. Congress has established, at least in most policy makers' minds, what level of "reserve surpluses" are necessary. The 1985 Food Security Act allows for price support cuts when surpluses exceed 5 billion pounds milk equivalent and allows for price support increases when government surplus purchases drop below 2.5 billion pounds. Therefore, the current standard is that if surplus purchases fall between 2.5 and 5 billion pounds milk equivalent, there is no surplus and no shortage.2

**Dairy Surplus and Milk Equivalent Accounting**

The CCC does not buy cows' milk. It buys butter, nonfat dry milk powder and cheddar cheese to support the farm price at its prescribed level (see Leaflet 5). Formulas must be used to determine the amount of fresh milk needed to make these products. To accomplish this, the USDA uses milk equivalent accounting.

The traditional milk equivalent accounting formula converts milk product weights to a raw milk equivalent on the basis of how much milkfat they contain. Nearly all milk equivalent statistics reported have been calculated on this milkfat basis for many years. For example, the USDA calculates that it requires the milkfat from about 21 pounds of milk to produce one pound of butter. Therefore, the milk equivalent of one pound of butter is 21 pounds. Similarly, it requires about 10 pounds of milk to produce one pound of cheddar cheese. On the other hand, nonfat dry milk contains no milkfat, yet it obviously requires milk to produce it. To calculate a milk equivalent for an amount of NDM, one must base the equivalency on the nonfat component of milk, often referred to as solids-not-fat or SNF. By this measure about 12 pounds of milk are needed to produce one pound of nonfat dry milk. Milk equivalent amounts of dairy products can be calculated according to any number of rules. The most likely option not already discussed would be total solids—the combination of milkfat and SNF.

A milk equivalent total can vary substantially depending on the accounting method used. A solids-not-fat basis would weight CCC purchases of nonfat dry milk purchases heavily and butter purchases lightly. Conversely, using the milkfat basis to convert to milk equivalents heavily weights butter while giving no weight to nonfat dry milk purchases. Total solids approaches try to give more equal weights to milkfat and SNF.

Butter and nonfat dry milk are joint products in that a hundredweight of milk yields butter and nonfat dry milk. If customers demand both products proportionate to production, CCC milk equivalent accounting poses few problems. However, if demand patterns are such that the commercial markets desire more of one product, problems arise.

Recently, the commercial market for nonfat dry milk has been extremely strong. Consequently, it has not been

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2See Leaflet 10 for a discussion of adjusting support prices according to supply and demand; see Leaflet 18 for a discussion on the uses of government stocks.
sold to the CCC. However, milkfat demand has been weak and the CCC has been sold large amounts of butter. Because the CCC uses a milkfat, milk equivalent basis for calculating surplus levels, milk equivalent dairy surpluses are mounting rapidly.

Table 2 compares the CCC net removals for the past five marketing years using a milkfat, a solids-not-fat, and two total solids based measures for calculating milk equivalents. The first total solids measure is a weighted average of the milkfat and SNF based equivalents, with weights approximating the relative proportions of milkfat and solids-not-fat in whole milk. The second total solids measure also is a weighted average of the milkfat and SNF-based totals. In this case the weighting scheme changes each year in accord with the relative dollar values the CCC assigns to butter and nonfat dry milk when the CCC purchase price calculations are made.

**TABLE 2. CCC Net Removals, 1984-85 to 1988-89.**

<table>
<thead>
<tr>
<th>Fiscal Year</th>
<th>Total Solids Basis</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Milkfat Basis</td>
<td>Solids-Not-Fat Basis</td>
<td>Composition Weighted</td>
<td>Value Weighted</td>
</tr>
<tr>
<td></td>
<td>(billion lbs., milk equivalent)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1984-85</td>
<td>11.5</td>
<td>11.3</td>
<td>11.4</td>
<td>11.4</td>
</tr>
<tr>
<td>1985-86</td>
<td>12.3</td>
<td>12.6</td>
<td>12.5</td>
<td>12.5</td>
</tr>
<tr>
<td>1986-87</td>
<td>5.4</td>
<td>7.1</td>
<td>6.6</td>
<td>6.3</td>
</tr>
<tr>
<td>1987-88</td>
<td>9.8</td>
<td>5.2</td>
<td>6.6</td>
<td>7.5</td>
</tr>
<tr>
<td>1988-89</td>
<td>9.2</td>
<td>0.5</td>
<td>3.1</td>
<td>4.7</td>
</tr>
</tbody>
</table>

1October 1 to September 30.
2Component weights of 70 percent and 30 percent for solids not-fat and milkfat, respectively.
3Weighted average of milkfat-based equivalent and SNF-based equivalent, where weights vary each year according to proportion of the total value of butter and NDM that CCC assign to each product when calculating CCC purchase prices. Computed on an annual average basis by Andrew Novakovic.
4Updated by Andrew Novakovic.


In the first two market years in Table 2, the CCC surplus purchases did not differ significantly across milk equivalent accounting formulas. In the 1986-87 marketing year, the CCC purchased relatively more nonfat dry milk and, therefore, milk equivalent surpluses look larger when measured on either a solids-not-fat basis or a total solids basis than a milkfat basis. Total solids based on composition or value result in similar milk equivalents. However, for marketing year 1987-88 and for these estimates for marketing year 1988-89, milkfat-based totals are much larger than the SNF total. Surpluses appear quite large when milkfat-based accounting is used, because milkfat equivalent accounting weights butter heavily. Because commercial markets have taken all of the nonfat dry milk powder produced since the middle of 1988, surpluses measured on a solids-not-fat basis are very small for 1988-89. Value weighted total solids results in milk equivalents very close to composition weighted total solids until 1987-88. The estimates for the last two fiscal years demonstrate that value weighting puts more emphasis on milkfat than composition weighting does.

Are the traditional, milkfat based net removals shown in the second column of Table 2 really surpluses? Nearly all the milk solids identified as milk equivalent net removals in 1988-89 were needed to satisfy the commercial markets for nonfat dry milk powder. In other words, in order to meet the commercial demand for dairy products, a large part of the current 8 to 9 billion pound "surplus" is actually not a surplus. Using a milkfat equivalency accounting system under these market conditions gives the incorrect impression that the dairy industry is out of equilibrium and is producing large surpluses. In fact, today the surplus is confined to butter, suggesting that price policy should focus on reducing butter surpluses not overall milk production.

With respect to total solids measurements, either a composition or value weighted total solids measure clearly reduces the distortions that either a milkfat-based or SNF-based measure will show when CCC purchase are unbalanced between butter and nonfat dry milk. When purchases are in fairly close balance, the differences in milk equivalent accounting are probably not terribly important. A composition weighted approach is more intuitively appealing if the objective is purely to measure milk equivalent quantities. A value weighted approach may more accurately depict the magnitude of a surplus relative to the more narrow interest of CCC program costs.

Dairy farmers incomes are affected by price support decisions. The price support decision has been based on the stated level of dairy surpluses. Under current market conditions, using milkfat equivalent accounting method implies a support price cut while the use of an alternative does not. Therefore, the milk equivalency accounting issue will be debated. Because nearly all dairy statistics reported on a milk equivalent basis have been converted using a milkfat equivalent formula, changing the way we account for milk equivalents will buck longstanding tradition and will affect how we measure all dairy product sums, e.g., imports, stocks, and commercial demand. Changing milk equivalent measures on only CCC net removals would probably be more confusing than helpful.

**Dairy Surpluses are Required for Food Programs**

Dairy products acquired by the CCC are high quality and nutritious foods. Although they have been processed into storable forms, they will eventually spoil. Over the years, a significant number of domestic and international feeding and trade programs have used surplus dairy products. If the CCC does not purchase dairy products, people currently receiving surplus dairy products would lose access to a valuable source of nutrition. Therefore, some argue that a portion of the USDA surpluses are "required" for government domestic and
international feeding programs, and because these products are "needed" they should not be counted as dairy surpluses.

Donations historically have been the dominant means of using surplus dairy products (see Leaflet 18 for additional details on donations and the general use of CCC stocks). In the past, donations were made primarily through international programs. As dairy surpluses grew, Congress provided new programs so that dairy surpluses could be used more in domestic donation programs. The agencies and people receiving these stocks find them very helpful in their programming efforts. With few exceptions, these feeding programs only have access to dairy products when the CCC provides them at no cost. With the dramatic reduction in CCC stocks as a result of the 1985 Food Security Act, some distribution channels serving the needy were no longer able to get all of the dairy products they wanted. People now going without dairy donations are expressing their desire for dairy products. This has led to the argument that because these dairy products are "needed," donated products are not really surpluses.

There are two counter arguments to this line of reasoning. First, domestic and foreign feeding programs were established expressly for disposing of surplus products and were not intended to be permanent government subsidized food markets. Second, some people who receive donated dairy products substitute the donated products for some other commodity or dairy product they currently are eating. Analysis by the USDA's Economic Research Service indicates that every hundred pounds of surplus cheese distributed through domestic feeding programs displaces 35 pounds of commercial market cheese. The ERS analysis also indicates that every pound of butter donated usually replaces one pound of margarine from commercial food market sales.

Recent outcries resulting from the reduction in dairy donations clearly indicates that there is a portion of the consuming public that cannot, will not, or prefer not to buy dairy products from commercial markets at existing price levels. If government wants to make a commitment to subsidize dairy purchases for this segment of society, more of the supply of milk would be allocated to a subsidized government market. Removing these "required" purchases from the CCC's responsibility would lower today's determination of what a dairy surplus is. It might also lead to the purchasing agencies demanding that they have a say in what dairy products should be purchased or even whether dairy products should be purchased at all. Because the price support cut depends on the surplus level, legislation requiring that feeding program usage be subtracted from the surplus will likely be proposed and pushed.

**Pounds or Dollars?**

The 1985 Food Security Act established the price support cut trigger at the five billion pound level. With the major policy focus on the budget deficit, the level of government expenditures for dairy surpluses is as important as the actual quantity of milk equivalent products purchased.

Generally, surplus purchases and government expenditures are correlated, but they need not rise and fall on a one for one basis. When producers pay assessments to fund their price support program, net expenditures are lower than the CCC purchase level would suggest. Milk Diversion Program (MDP) and Dairy Termination Program (DTP) expenses caused net expenditures to increase even as the programs actually held purchases down. Similarly, in the situation where the government is purchasing only butter, the surplus volumes indicate a higher surplus than would be indicated by the government expenditures on the dairy price support program. Table 3 dramatically illustrates this point.

<table>
<thead>
<tr>
<th>Year</th>
<th>Net CCC Milk Fat Basis</th>
<th>Net CCC Expenditures</th>
<th>Cost of Price Support Program ($)/cwt</th>
</tr>
</thead>
<tbody>
<tr>
<td>1984-85</td>
<td>11.5</td>
<td>2,085</td>
<td>18.13</td>
</tr>
<tr>
<td>1985-86</td>
<td>12.3</td>
<td>2,337</td>
<td>19.00</td>
</tr>
<tr>
<td>1986-87</td>
<td>5.4</td>
<td>1,166</td>
<td>21.60</td>
</tr>
<tr>
<td>1987-88</td>
<td>9.7</td>
<td>1,295</td>
<td>13.35</td>
</tr>
<tr>
<td>1988-89</td>
<td>9.2</td>
<td>658</td>
<td>7.15</td>
</tr>
</tbody>
</table>

1 ASCS Commodity Fact Sheet, 1988-89, April 1989 USDA, Agricultural Stabilization and Conservation Service. Net expenditures include MDP and DTP payments and assessment revenue, as well as expenses and income associated with purchases of dairy products.

2 Preliminary estimates.

In Table 3, the second and third columns are the milk equivalent, milkfat basis, purchases and net expenditures, respectively, for dairy products in recent marketing years. The fourth column is the third column divided by the second, expressing net expenditure per hundred pounds of milk equivalent net removals (milkfat basis). The cost in marketing year 1987-88 and the estimated costs for 1988-89 are substantially lower than earlier years. This again reflects the fact that the USDA recently has been purchasing butter, but no nonfat dry milk and little cheese.

If the dairy industry price support program was judged by its contribution to lowering U.S. government expenditures, measuring the surplus on a dollar basis implies significant improvement. Measuring that same surplus on a physical quantity (per hundredweight) basis implies a different performance level. Once again, the meaning of a dairy surplus is less obvious and straightforward than many observers believe.

**Conclusions**

The question 'what is a dairy surplus?' will be part of the debate on the 1990 dairy legislation. Clearly, dairy surplus measurement is not as simple and clear-cut as many outside the dairy industry believe or would like to believe. However, as long as the dairy price support is above the long-run market clearing price, real milk surpluses will be produced. If in the 1990 farm bill, Congress persists in using the volume and/or costs of the dairy surplus purchases to determine milk prices, the debate on what is the "real" dairy surplus will continue well into the 1990s.